

### ABSTRACT OF THE DISCLOSURE

Robust microfluidic mixing devices mix multiple fluid streams passively, without the use of moving parts. In one embodiment, these devices contain microfluidic channels that are formed in various layers of a three-dimensional structure. Mixing may be accomplished with various manipulations of fluid flow paths and/or contacts between fluid streams. In various embodiments, structures such as channel overlaps, slits, converging/diverging regions, turns, and/or apertures may be designed into a mixing device. Mixing devices may be rapidly constructed and prototyped using a stencil construction method in which channels are cut through the entire thickness of a material layer, although other construction methods including surface micromachining techniques may be used.